
Z(ee)+nJets

update

- Correction factors vs jet multiplicity:
 - o EM
 - o Tracking
 - o Trigger
- Plans



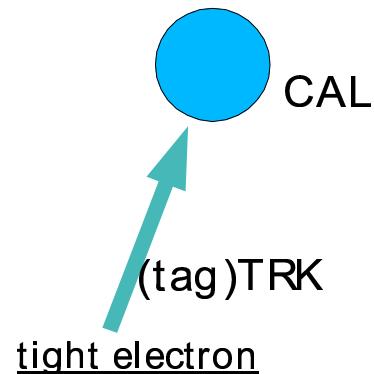
Samples

- **Data:**
 - EM1TRK skim
 - Single EM triggers
 - Run range: 20 April 2002 – 28 June 2004 (Runs 151817 - 194566)
 - Rejecting bad runs (CAL, SMT, CFT, Jet/Met, Lumi)
 - 323 pb-1
 - No t42 applied
 - Processed with ATHENA (v01-05-02)
- **MC:**
 - Z/γ^* → $e^+e^- + X$: 400k Pythia
 - ($Z \rightarrow ee j$: 150k Alp+Pythia)
 - ($Z \rightarrow jj j$: 40k Alp+Pythia)
 - (Still working on $Z \rightarrow jjjj \dots$)
 - Processed with ATHENA (v01-05-02)

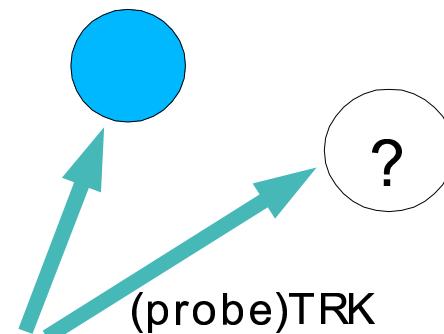


EM Efficiencies: Method

Tag:



Probe:



Z(ee) + n Jets Analysis Cuts:

PVX < 60cm

Tag-Electron: EMF > 0.9, Iso < 0.15, H_Mx7 < 12., p_T > 25 GeV, $|\eta| < 1.1$, **with phi cracks,**
matched with a good track in $\Delta R(<0.14)$

Trigger: tag electron is required to have fired single electron trigger

Tag & ProbeTracks: $25 \text{ GeV} < p_T < 80 \text{ GeV}$, Chi2 < 8.0, $|DCA0| < 0.3$, $|DCA1| < 4.0$, $|\eta| < 1.1$, **with phi cracks**

Probe: Good track separated from Tag by $\Delta\Phi > 2.0$

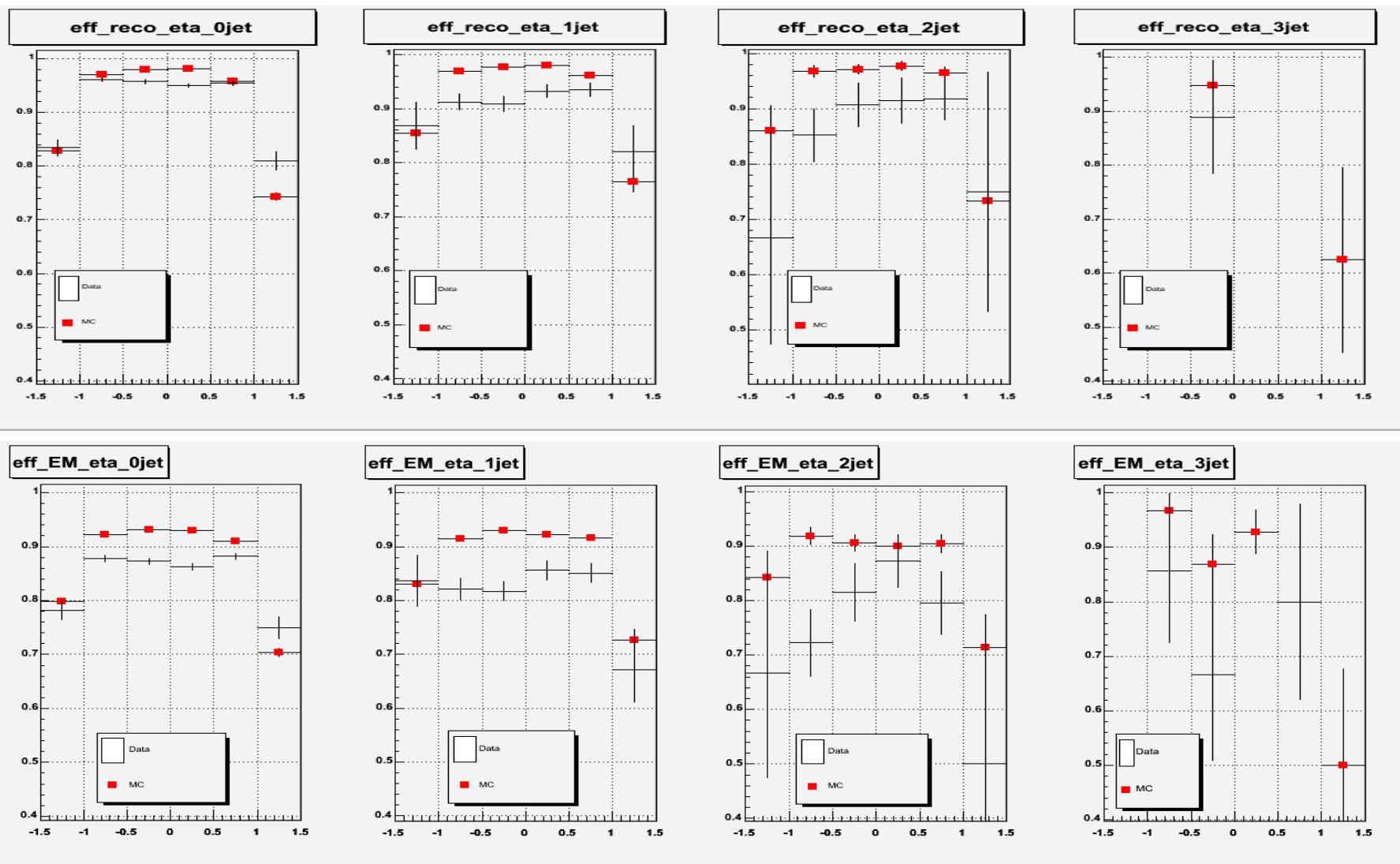
Background reduction: Opposite sign track requirement, MET<15GeV, Sidebands

TagElec-ProbeTrack-invmass cut: $70 \text{ GeV} < M_{ee} < 110 \text{ GeV}$

Reco matching cone: $dR = \sqrt{(\Delta\eta^2 + \Delta\Phi^2)} = \sqrt{(.1^2 + .1^2)} = 0.14$

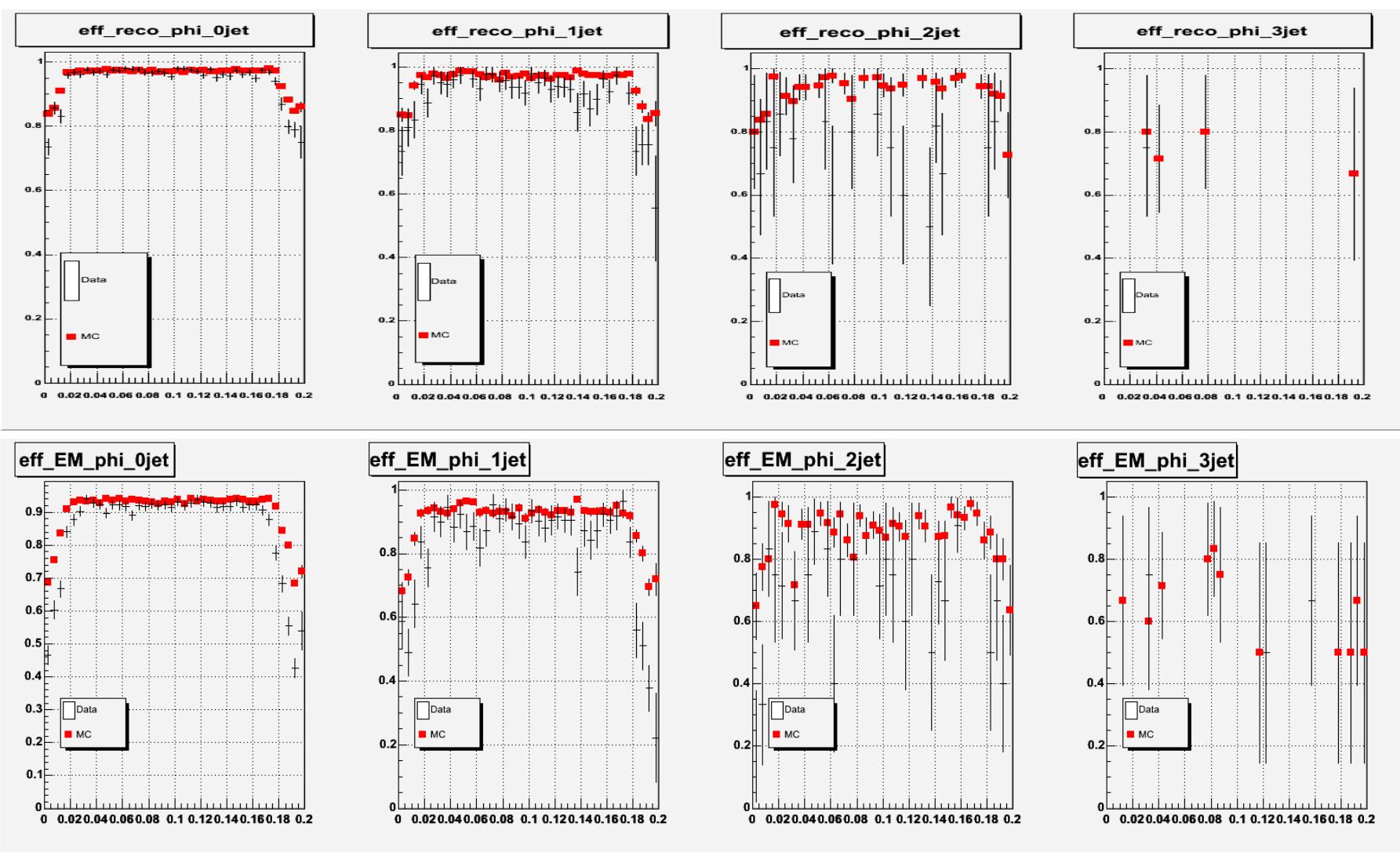
Jets: $0.05 < \text{EMF} < 0.95$, HotF < 10.0, N90 > 1, CHF < 0.4, L1conf, $p_T > 20.$, $|\eta| < 2.5$, **not counting jets**
overlapping with probe tracks within $\Delta R < 0.4$

Parameterized Reco/EM Efficiencies (eta)



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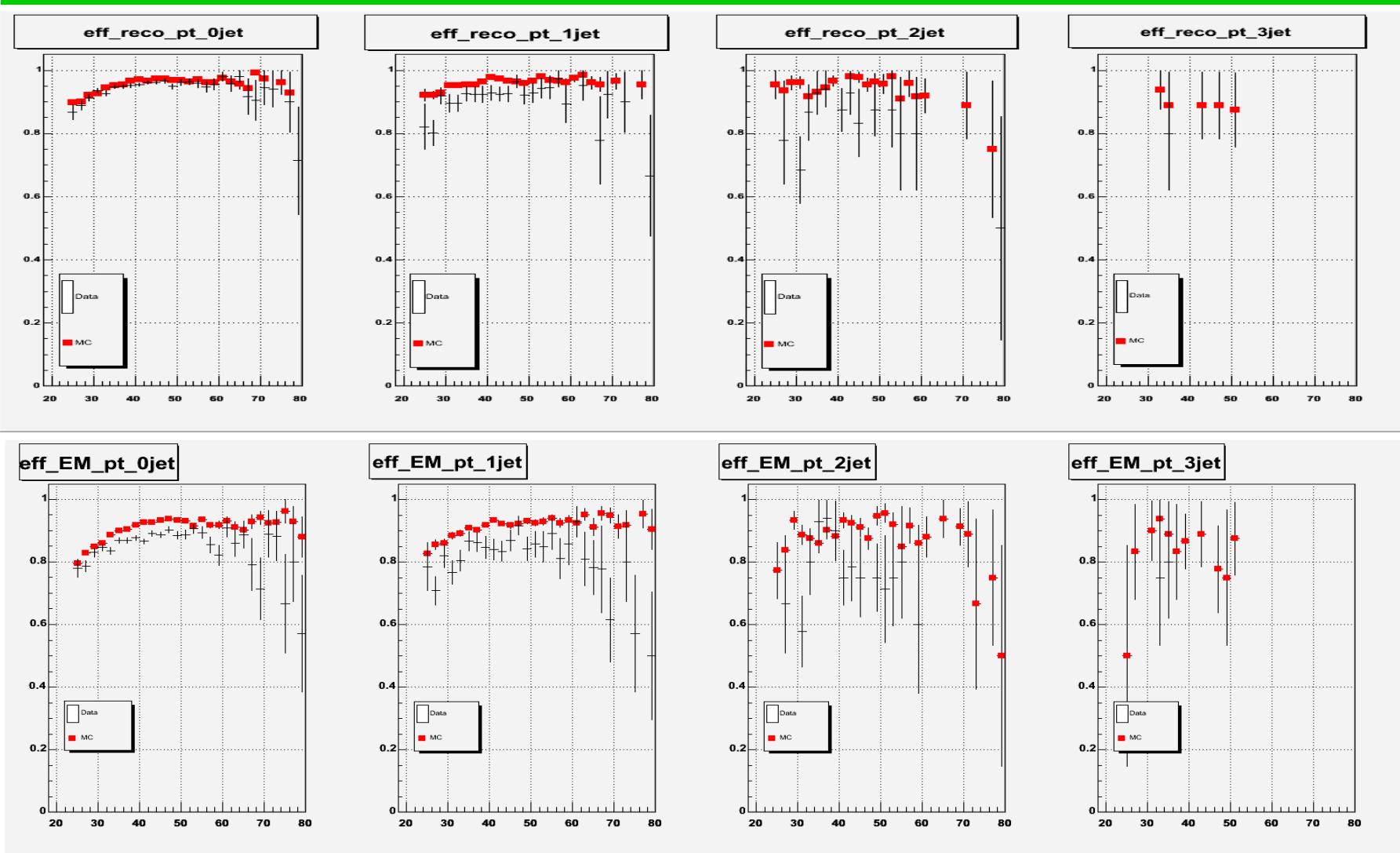
Parameterized Reco/EM Efficiencies (phi)



Marc Buehler H(Multilepton) 10-07-04

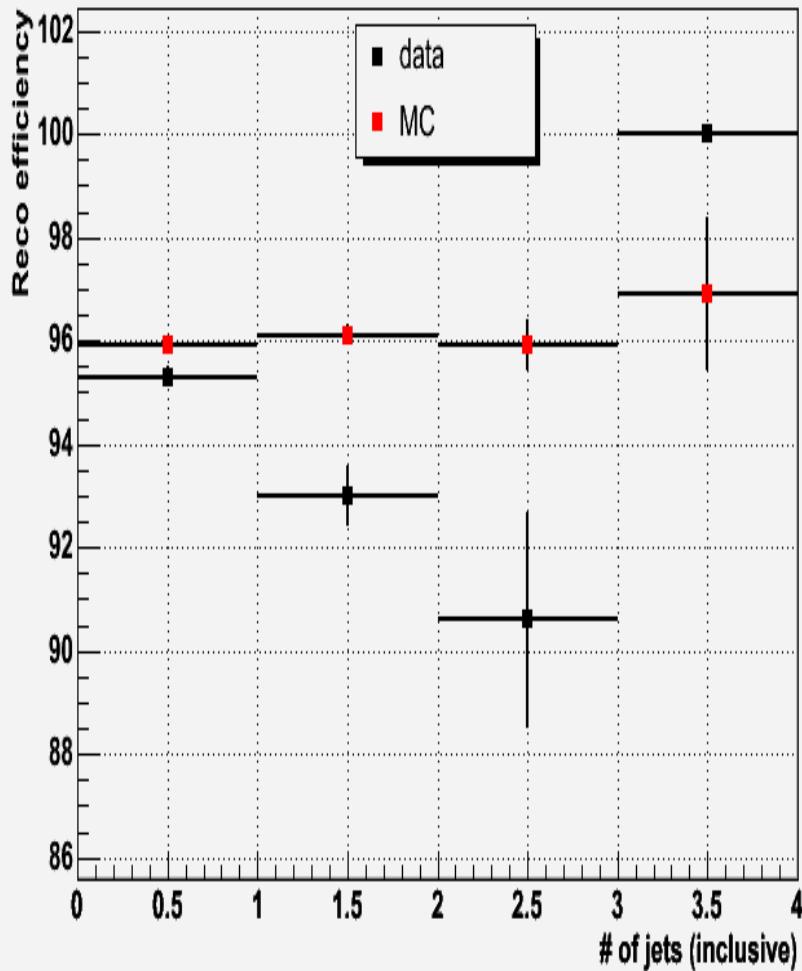
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Parameterized Reco/EM Efficiencies (pt)

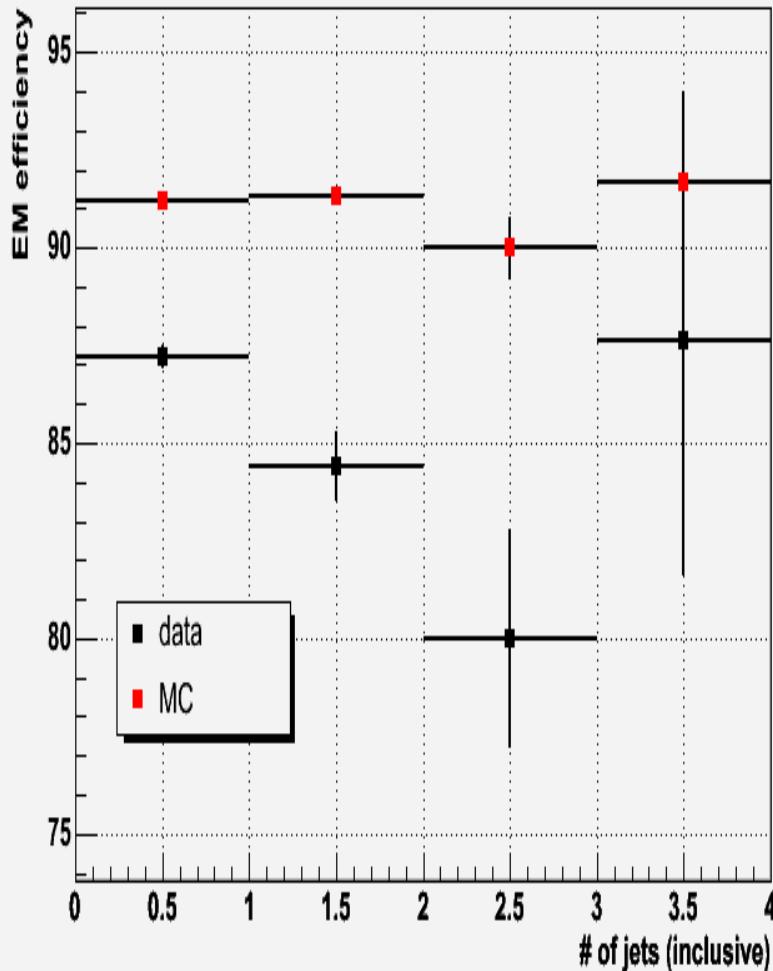


Averaged Reco/EM Efficiencies vs Jet Multiplicity

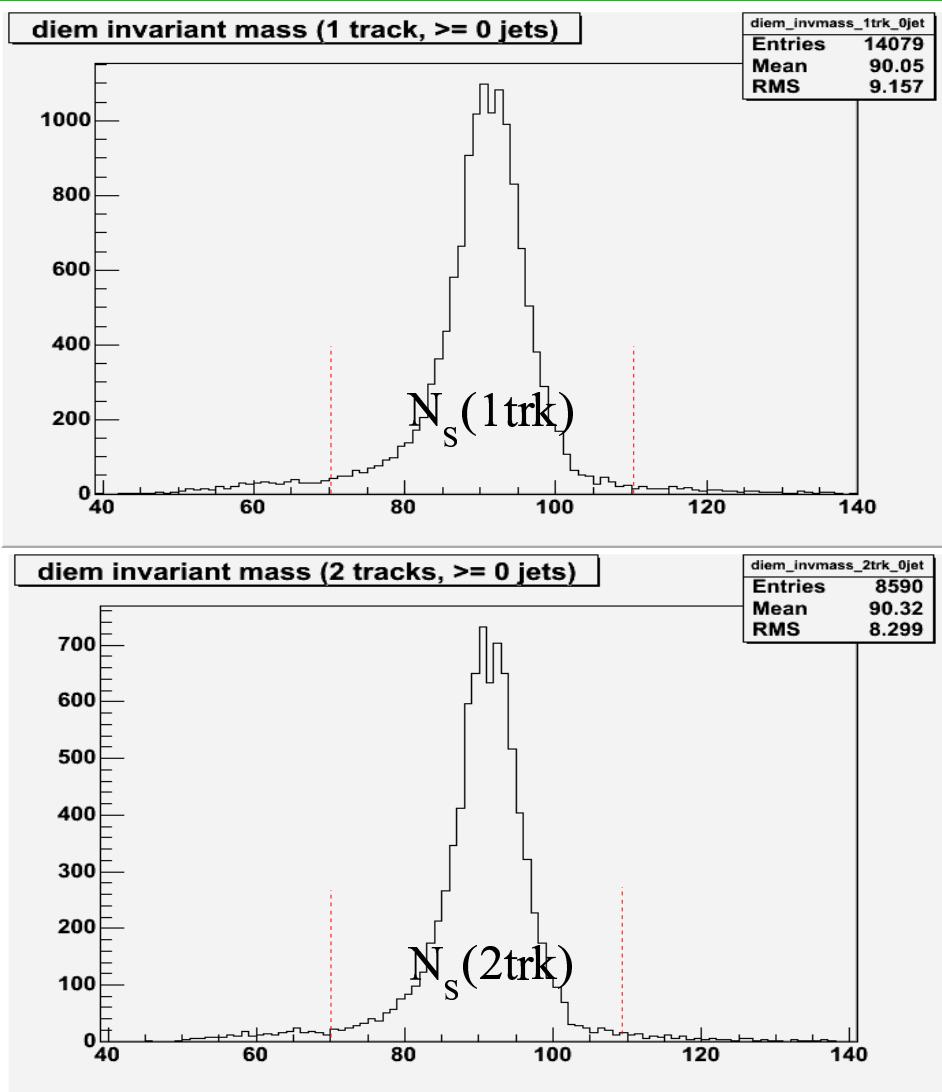
Data vs MC: Reco efficiencies vs Jet Multiplicity



Data vs MC: EM efficiencies vs Jet Multiplicity



Tracking Efficiencies: Method

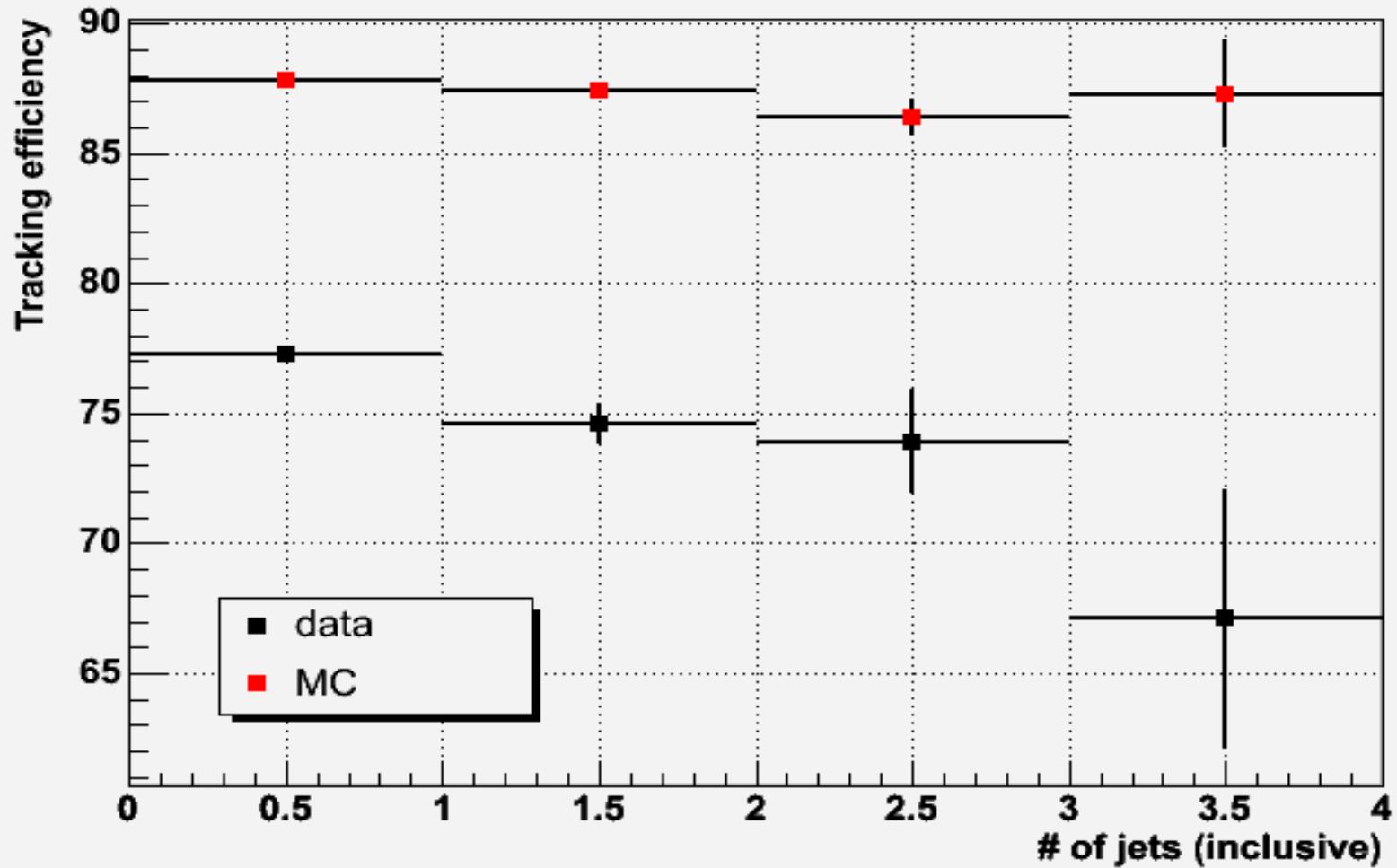


- extracting $N_s(1\text{trk})$ and $N_s(2\text{trk})$ using sidebands for background subtraction (40-70GeV and 110-140GeV)
- Effi = $2N_s(2\text{trk})/(N_s(2\text{trk})+N_s(1\text{trk}))$



Averaged Tracking Efficiencies vs Jet Multiplicities

Data vs MC: Tracking efficiencies vs Jet Multiplicity



Trigger Efficiencies

- Using a combination of unprescaled single EM triggers
- For an event to be used, a candidate electron must fire one of these triggers
- Preferred order:
 - CMT 8 to 11 trigger combinations (runs ≤ 178721)
 - **EM_H_SH or EM_H_2EM5_SH**
 - **EM_H_SH**
 - **EM_H**
 - **EM_MX_SH**
 - **EM_MX**
 - CMT 12 trigger combination
 - **E1_SHT20 or E2_SHT20 or E3_SHT20 or E1_SH30**
 - **E1_SHT20 or E2_SHT20 or E3_SH30**
 - **E1_SHT20 or E3_SH30**
 - **E1_SHT20**



Trigger Efficiencies contd

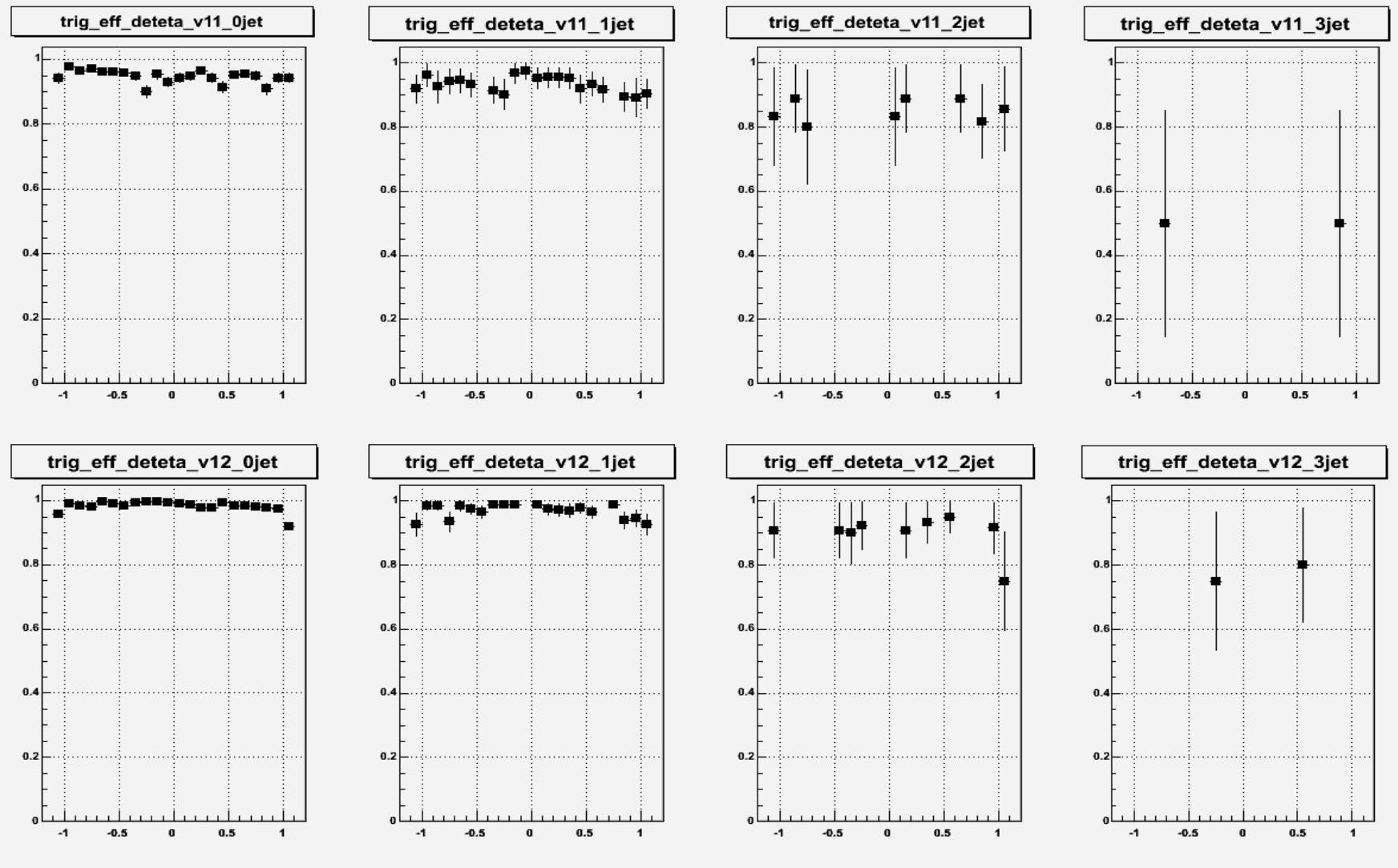
Trigger	L1	L2	L3
EM_HI_SH	CEM(1,10)	EM(1,12)	ELE_LOOSE_SH_T(1,20)
EM_HI_2EM5_SH	CEM(2,5)	EM(1,12)	ELE_LOOSE_SH_T(1,20)
EM_HI	CEM(1,10)	EM(1,12)	ELE_LOOSE(1,30)
EM_MX_SH	CEM(1,15)	none	ELE_LOOSE_SH_T(1,20)
E1_SHT20	CEM(1,11)	none	ELE_NLV_SHT(1,20)
E2_SHT20	CEM(2,6)	none	ELE_NLV_SHT(1,20)
E3_SHT20	CEM(1,9)CEM(2,3)	none	ELE_NLV_SHT(1,20)
E1_SH30	CEM(1,11)	none	ELE_NLV_SH(1,30)

→ Trigger efficiencies based on tag-and-probe:

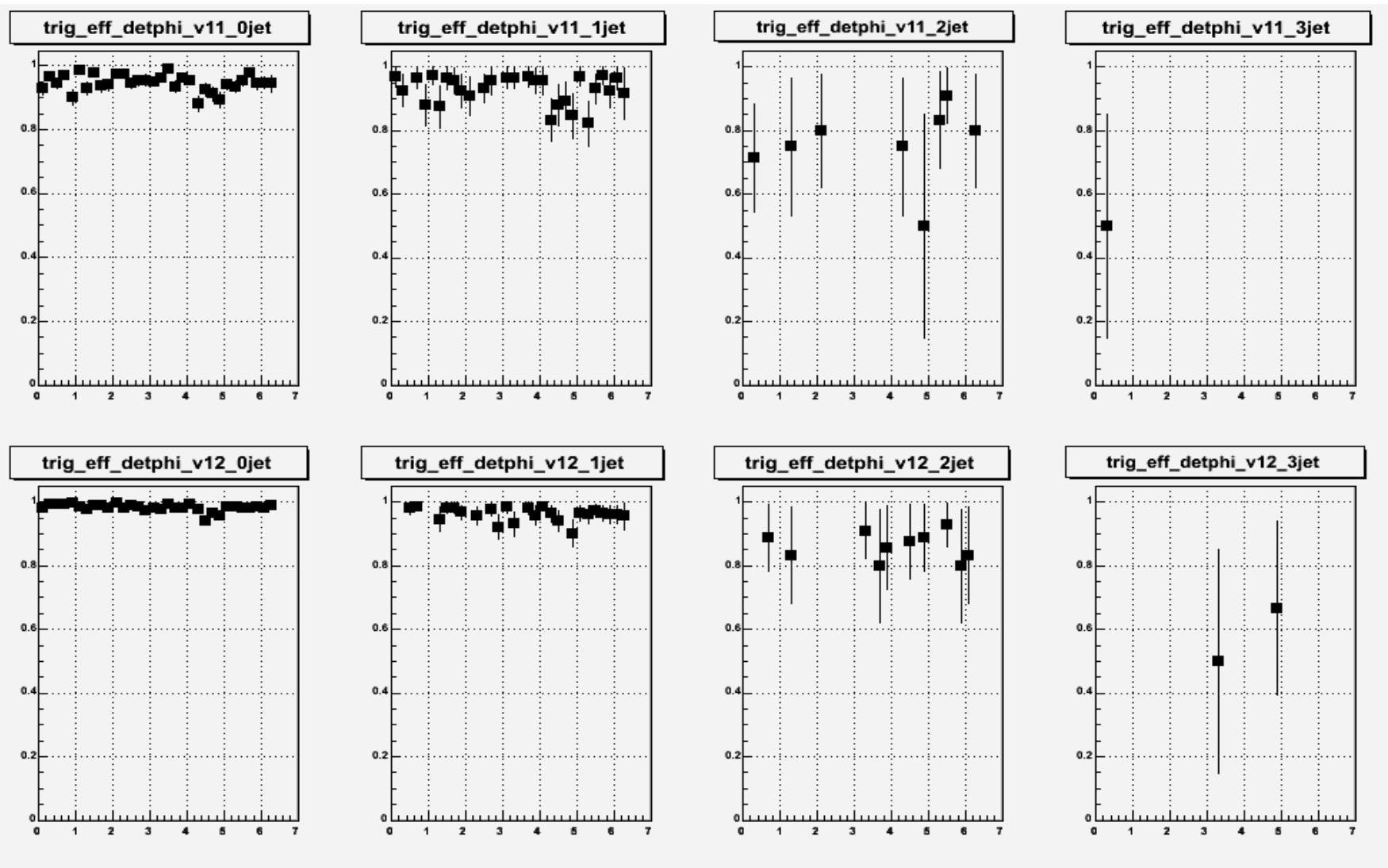
- Using Z candidate events with inv mass between 70GeV and 110 GeV
- Both Z candidate electron are considered as possible tags
- An electron becomes a tag if it has a matched track and passes trigger requirements for at least one unprescaled trigger in the trigger combination
- To pass a trigger's requirement, an electron must have a matching trigger object at each level which passes all cuts for the corresponding trigger
- Matching requirements: L1,L2,L3 $\Delta R < 0.4$



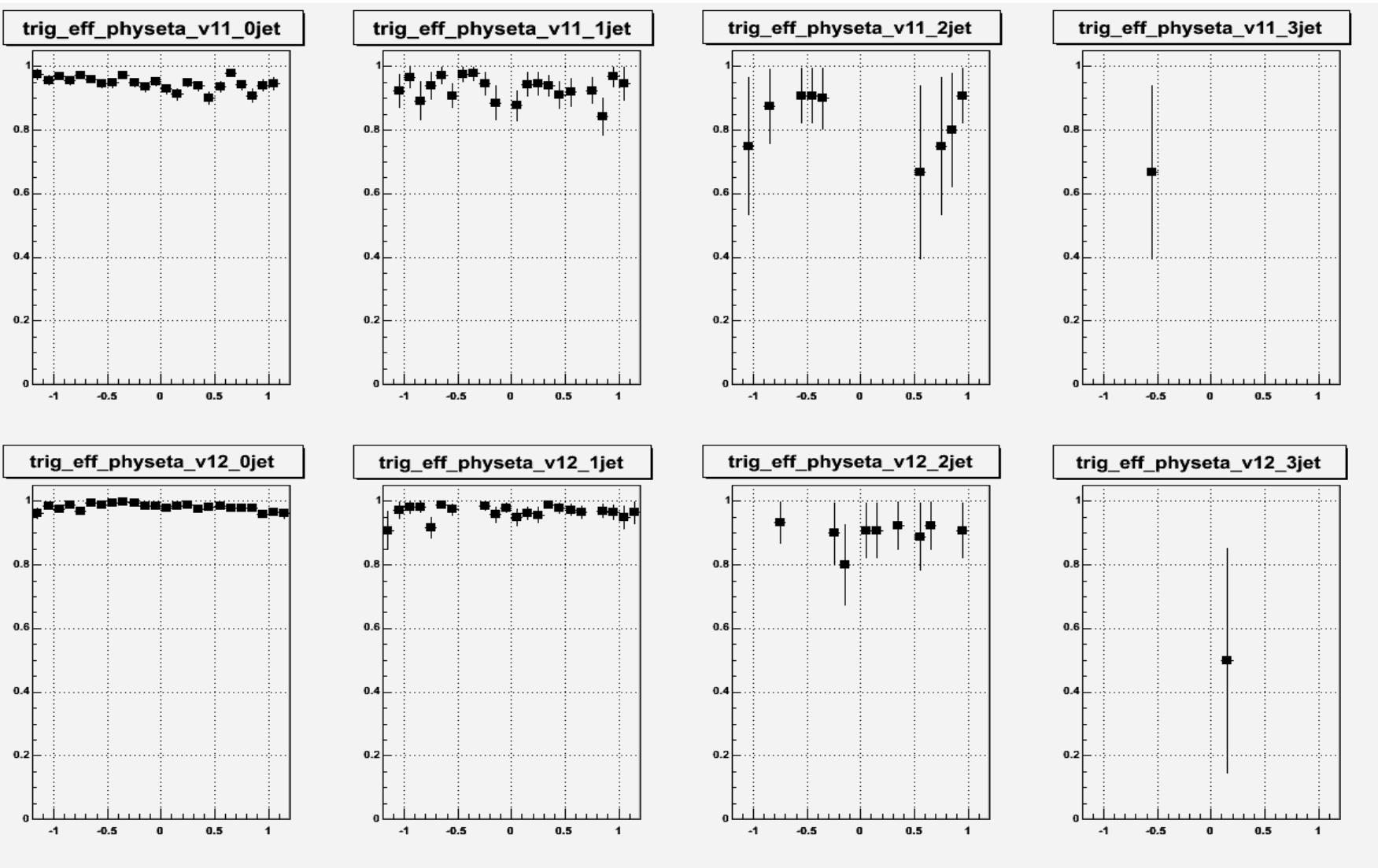
Parameterized Trigger Efficiencies (det_eta):



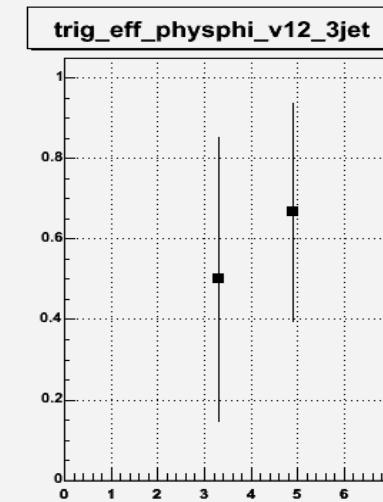
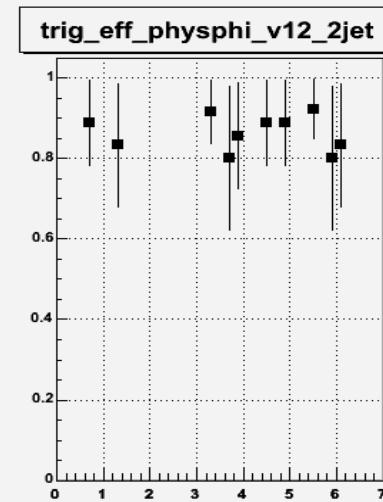
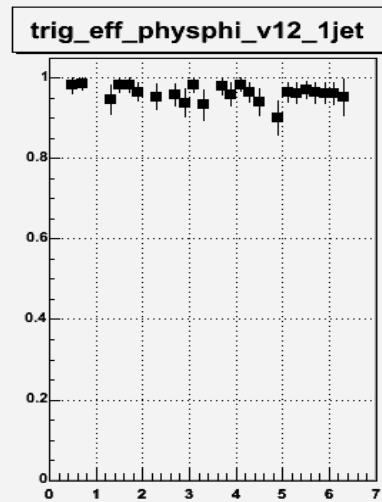
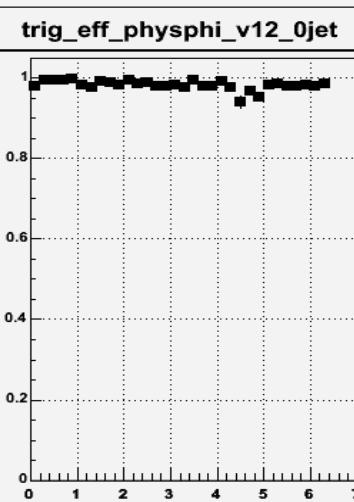
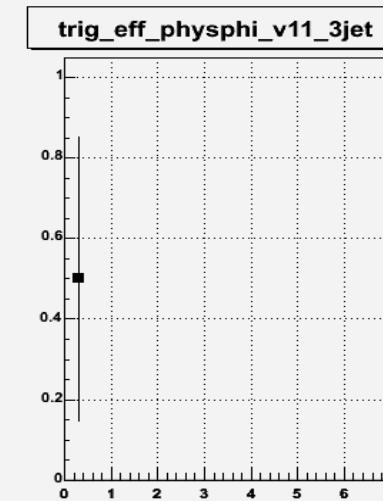
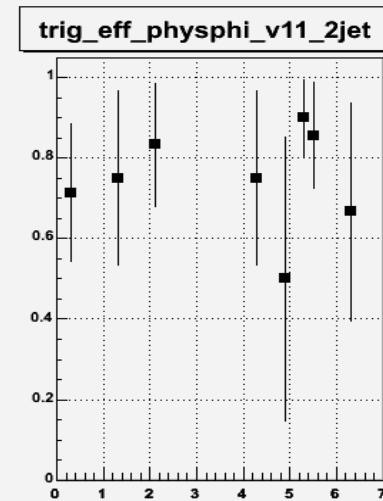
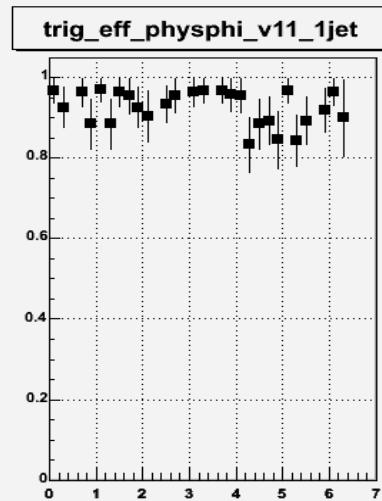
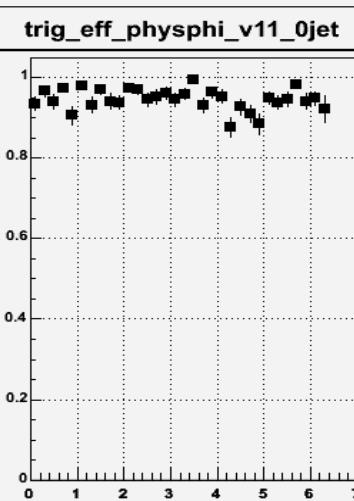
Parameterized Trigger Efficiencies (det_phi):



Parameterized Trigger Efficiencies (phys_eta):



Parameterized Trigger Efficiencies (phys_phi):



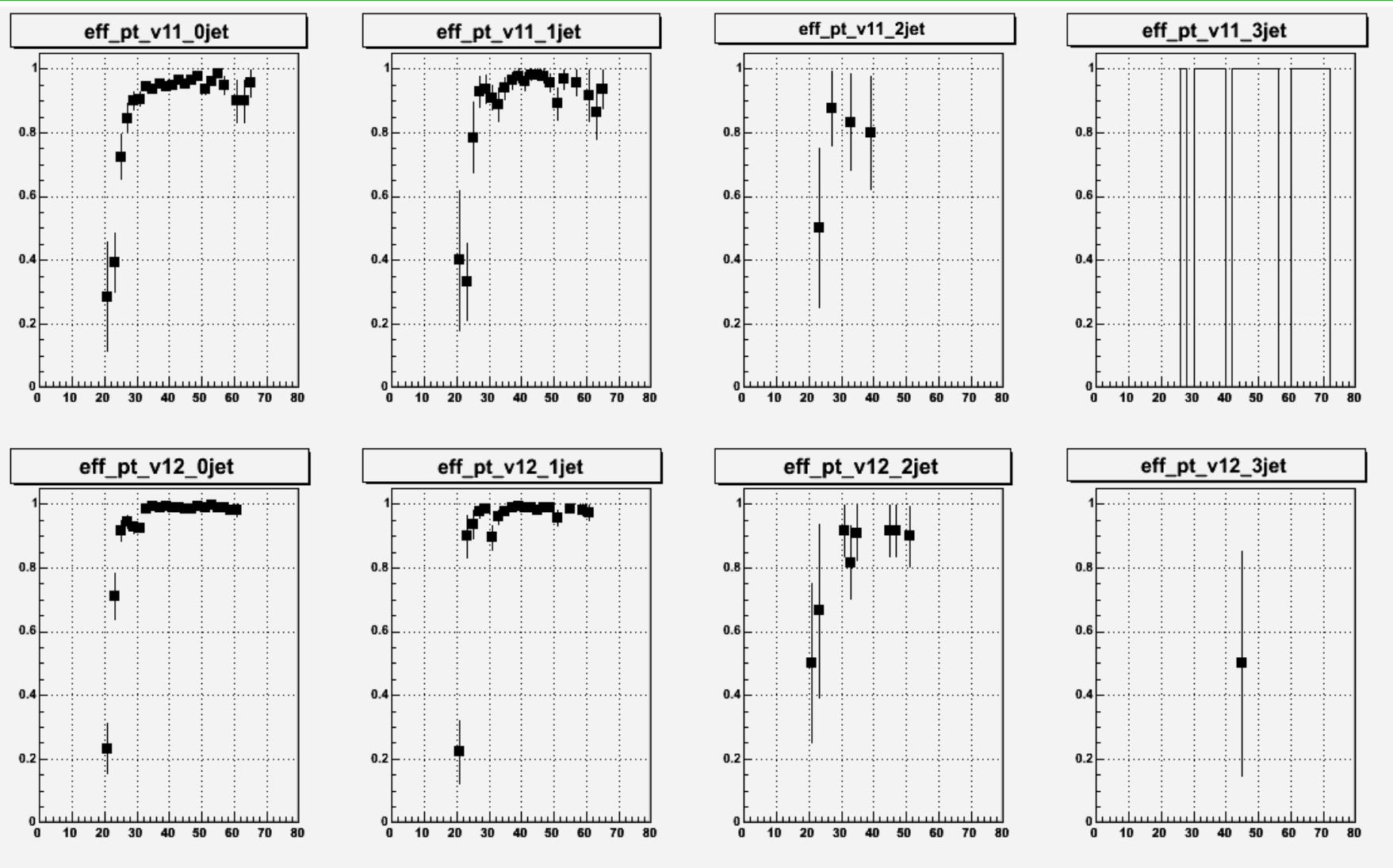
Marc Buehler

H(Multilepton)

10-07-04

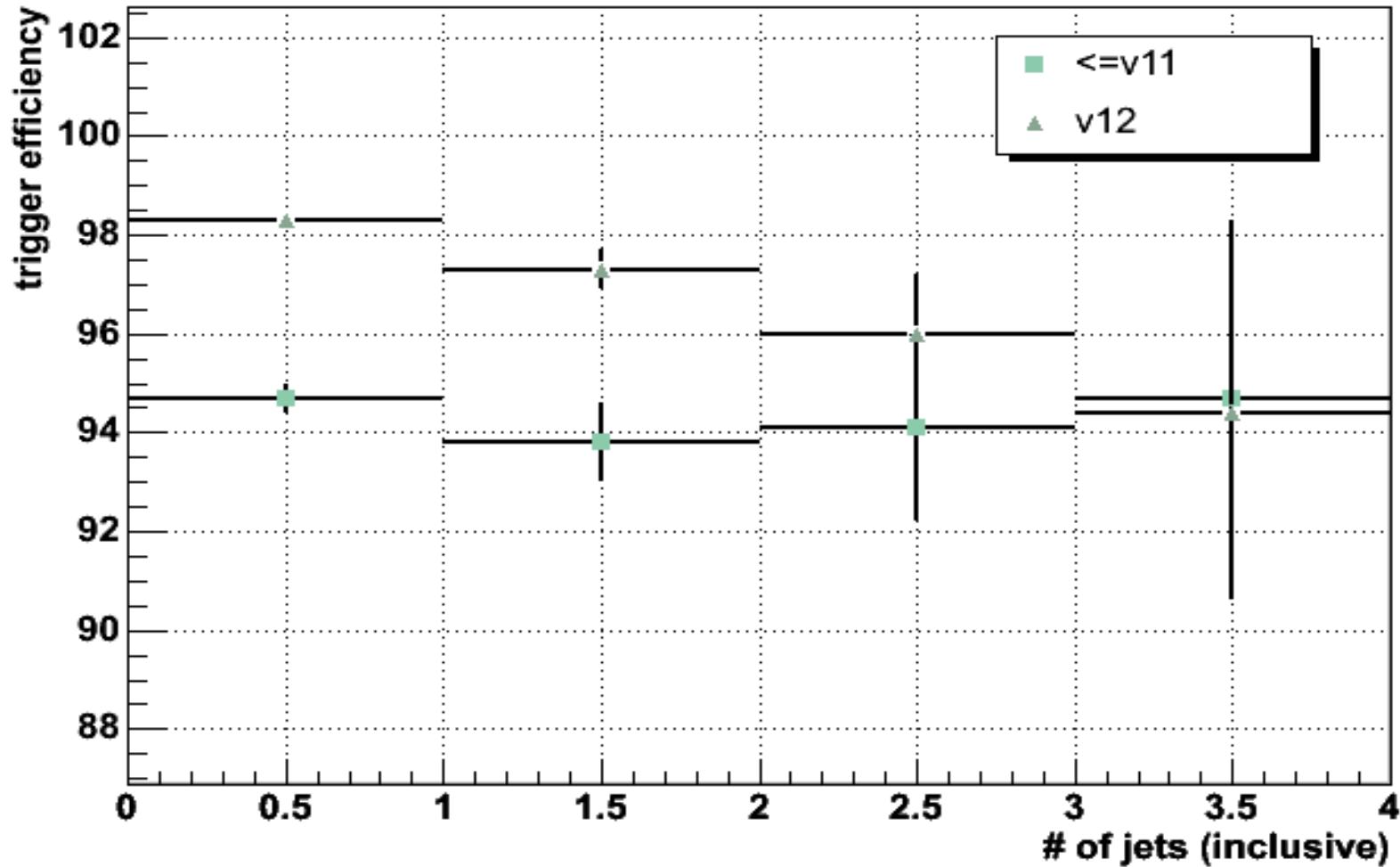
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Parameterized Trigger Efficiencies (pt):



Averaged Trigger Efficiencies vs Jet Multiplicity

Averaged Trigger Efficiencies vs Jet Multiplicity



Plans

- **Acceptance vs Jet Multiplicity**
- **Data vs MC comparisons**
- **Jet Reco Efficiency (James)**
- **Xsection vs Jet Multiplicity**

